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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/635,574	08/07/2003	Takamichi Tsuchiya	241342US2S	8299

22850 7590 08/26/2004

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EXAMINER	
QUINTO, KEVIN V	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 08/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/635,574	TSUCHIYA ET AL.	
	Examiner	Art Unit	
	Kevin Quinto	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☒ Claim(s) *1-16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3 November 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3, 4, 5, 6, and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Miki et al. (USPN 6,342,712 B1).

4. In reference to claims 1, 3, and 5, Miki et al. (USPN 6,342,712 B1, hereinafter referred to as the "Miki" reference) discloses a similar device. Figure 9 illustrates a semiconductor device with a capacitor formed over an insulating film (1006). The capacitor has a bottom electrode (1008), a top electrode (1010), and a dielectric film (1009) between them. A plug (1007) passes through the insulating film (1006) and is connected to the bottom electrode (1008). An

oxygen barrier film (1011 or 1012) covers the capacitor and the insulating film (4). Miki discloses (column 8, lines 46-48) that the barrier film (1011) is made of an iridum/iridium oxide stack, which can act as an oxygen barrier film as specified by the applicant (p. 8, lines 2-6). Miki discloses that the barrier film (1012) is made of titanium nitride, which is a known oxygen barrier film (see Melnick, USPN 5,998,258, claims 12 and 26).

5. In reference to claim 4, figure 9 of Miki shows that a transistor is connected to the plug (1007).

6. With regard to claim 6, the plug (1007) is made of polysilicon (column 8, lines 18-22).

7. In reference to claim 8, the dielectric film (8) is made of a ferroelectric material (column 8, lines 27-30).

8. Claims 1-6, 8-13, 15, and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Hartner et al. (USPN 6,559,003 B2).

9. In reference to claims 1, 3, and 5, Hartner et al. (USPN 6,559,003 B2, hereinafter referred to as the "Hartner" reference) discloses a similar device. Figures 2a, 2b, and 3 each illustrate a semiconductor device with a capacitor formed over an insulating film (4). The capacitor has a bottom electrode (7), a top electrode (9), and a dielectric film (8) between them. A plug (3) passes through the insulating film (4) and is connected to the bottom electrode (7). An oxygen barrier film (10) covers the capacitor and the insulating film (4). Hartner discloses (column 5, lines 39-63) the use of a second barrier layer (10), as well as an "X layer," which can each act as a hydrogen and as an oxygen barrier film

since they each use materials (column 5, lines 39-60) which have been defined by the applicant as having a lower hydrogen and an oxygen permeability than the insulating film (4).

10. With regard to claim 2, Hartner uses a film (5) under the insulating film (4) which can act as an oxygen barrier film since it is made of a material (column 4, lines 24-36) which has been defined by the applicant as having a lower oxygen permeability than the insulating film (4).

11. In reference to claim 4, figures 2a, 2b, and 3 of Hartner each show that a transistor is connected to the plug (3).

12. With regard to claim 6, the plug (3) is made of polysilicon (column 4, lines 40-43).

13. In reference to claim 8, the dielectric film (8) is made of a ferroelectric material (column 4, lines 51-54).

14. In reference to claims 9 and 12, Hartner (USPN 6,559,003 B2) discloses a similar device. Figure 3 illustrates a semiconductor device with a capacitor formed over an insulating film (4). The capacitor has a bottom electrode (7), a top electrode (9), and a dielectric film (8) between them. A plug (3) passes through the insulating film (4) and is connected to the bottom electrode (7). An oxygen barrier film (10) covers the capacitor and the insulating film (4). A barrier film (5A) is formed between the insulating film (4) and the plug (3). Hartner discloses (column 6, lines 13-16) that the barrier film (5A) is made of silicon nitride; which can act as an oxygen barrier film since its uses a material which has been defined by the applicant as having a lower oxygen permeability than

the insulating film (4). Hartner also discloses that silicon oxynitride, aluminum oxide, and titanium oxide are to used to protect the device from hydrogen (column 5, lines 46-60); which is the designated requirement (column 6, lines 6-11, claims 1, 8, and 12) for the barrier film (5A) between the insulating film (4) and plug (3). Therefore the use of these three films as the barrier film between the insulating film and the plug is clearly within the scope of the Hartner invention and thus meets the claim.

15. With regard to claim 10, Hartner uses a film (5) under the insulating film (4) that is made of a material (column 4, lines 24-36) which has been defined by the applicant as having a lower oxygen permeability than the insulating film (4).

16. In reference to claim 11, figures 2a, 2b, and 3 of Hartner each show that a transistor is connected to the plug (3).

17. With regard to claim 13, the plug (3) is made of polysilicon (column 4, lines 40-43).

18. In reference to claim 15, the dielectric film (8) is made of a ferroelectric material (column 4, lines 51-54).

19. In reference to claim 16, Hartner (USPN 6,559,003 B2) discloses a similar device. Figure 3 illustrates a semiconductor device with a capacitor formed over an insulating film (4). The capacitor has a bottom electrode (7), a top electrode (9), and a dielectric film (8) between them. A plug (3) passes through the insulating film (4) and is connected to the bottom electrode (7). Hartner discloses (column 5, lines 39-63) the use of a second barrier layer (10), as well as an "X layer," which can each act as a hydrogen and as an oxygen barrier film since

they each use materials (column 5, lines 39-60) which have been defined by the applicant as having a lower hydrogen and an oxygen permeability than the insulating film (4). A barrier film (5A) is formed between the insulating film (4) and the plug (3). Hartner discloses (column 6, lines 13-16) that the barrier film (5A) is made of silicon nitride; which can act as an oxygen barrier film since it uses a material which has been defined by the applicant as having a lower oxygen permeability than the insulating film (4).

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

21. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (USPN 6,342,712 B1) in view of Kim et al. (USPN 6,204,070 B1).

22. With regard to claim 5, Miki does not disclose the use of silicon nitride or silicon oxynitride as the barrier layer (1011). Miki discloses that the barrier layer (1011) functions as a hydrogen prevention layer (column 8, lines 46-48). However the use of silicon nitride and silicon oxynitride as a barrier layer is well known in the art. Kim et al. (USPN 6,204,070 B1, hereinafter referred to as the "Kim" reference) discloses the use of silicon nitride and silicon oxynitride as a barrier film has the advantage of keeping the stoichiometry of the ferroelectric

material stable when used as an oxygen or hydrogen barrier (column 5, lines 15-29). In view of Kim, it would therefore be obvious to use silicon nitride and silicon oxynitride as the barrier layer in the device of Miki.

23. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (USPN 6,342,712 B1) in view of Kim et al. (United States Patent Application Publication No. US 2002/0196653 A1).

24. With regard to claim 5, Miki does not disclose the use of silicon nitride, aluminum oxide, or titanium oxide as the barrier layer (1011). Miki discloses that the barrier layer (1011) functions as a hydrogen prevention layer (column 8, lines 46-48). However the use of silicon nitride, aluminum oxide, and titanium oxide as a barrier layer is well known in the art. Kim et al. (United States Patent Application Publication No. US 2002/0196653 A1, hereinafter referred to as the "Kim 653" reference) discloses the use of silicon nitride, aluminum oxide, and titanium oxide as a barrier film has the advantage of being able to prevent hydrogen from reacting with oxygen when used as a hydrogen barrier (p. 2, paragraph 26) for the ferroelectric material which in turn prevents any deterioration of the leakage current characteristics of the ferroelectric capacitor. In view of Kim 635, it would therefore be obvious to use silicon nitride, aluminum oxide, or titanium oxide as the barrier layer in the device of Miki.

25. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (USPN 6,342,712 B1) in view of Jenq (USPN 6,211,079 B1).

26. With regard to claim 6, Miki does not disclose the use of tungsten as the material for the plug. However the use of tungsten in plugs is well known in the

art. Jenq (USPN 6,211,079 B1) discloses a memory device, in figures 3A-3E, which uses a tungsten plug since it has a low resistance and leads to a faster operating speed (abstract, column 2, lines 49-51 and column 4, lines 65-67) which is desirable in the art (column 2, lines 27-30 and 49-51). In view of Jenq, it would therefore be obvious to use a tungsten plug in the memory device of Miki.

27. Claims 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hartner et al. (USPN 6,559,003 B2) in view of Jenq (USPN 6,211,079 B1).

28. With regard to claim 6, Hartner does not disclose the use of tungsten as the material for the plug. However the use of tungsten in plugs is well known in the art. Jenq (USPN 6,211,079 B1) discloses a memory device, in figures 3A-3E, which uses a tungsten plug since it has a low resistance and leads to a faster operating speed (abstract, column 2, lines 49-51 and column 4, lines 65-67) which is desirable in the art (column 2, lines 27-30 and 49-51). In view of Jenq, it would therefore be obvious to use a tungsten plug in the memory device of Hartner.

29. With regard to claim 13, Hartner does not disclose the use of tungsten as the material for the plug. However the use of tungsten in plugs is well known in the art. Jenq (USPN 6,211,079 B1) discloses a memory device, in figures 3A-3E, which uses a tungsten plug since it has a low resistance and leads to a faster operating speed (abstract, column 2, lines 49-51 and column 4, lines 65-67) which is desirable in the art (column 2, lines 27-30 and 49-51). In view of Jenq, it

would therefore be obvious to use a tungsten plug in the memory device of Hartner.

30. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (USPN 6,342,712 B1) in view of Hahm et al. (USPN 5,932,492).

31. In reference to claim 7, Miki does not disclose the use of iridium as the bottom electrode (7). However the use of iridium electrodes in ferroelectric capacitors is well known in the art. Hahm et al. (USPN 5,932,492, hereinafter referred to as the "Hahm" reference) discloses that using iridium as the bottom electrode in a ferroelectric capacitor has the advantages of being highly conductive as well as having a resistance to oxidation (column 1, lines 56-65) which in turn prevents an undesirable decrease in the electrical conductivity of the electrode. In view of Hahm, it would therefore be obvious to use iridium for the bottom electrode in the device of Miki.

32. Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hartner et al. (USPN 6,559,003 B2) in view of Hahm et al. (USPN 5,932,492).

33. In reference to claim 7, Hartner does not disclose the use of iridium as the bottom electrode (7). However the use of iridium electrodes in ferroelectric capacitors is well known in the art. Hahm (USPN 5,932,492) discloses that using iridium as the bottom electrode in a ferroelectric capacitor has the advantages of being highly conductive as well as having a resistance to oxidation (column 1, lines 56-65) which in turn prevents an undesirable decrease in the electrical

conductivity of the electrode. In view of Hahm, it would therefore be obvious to use iridium for the bottom electrode in the device of Hartner.

34. In reference to claim 14, Hartner does not disclose the use of iridium as the bottom electrode (7). However the use of iridium electrodes in ferroelectric capacitors is well known in the art. Hahm (USPN 5,932,492) discloses that using iridium as the bottom electrode in a ferroelectric capacitor has the advantages of being highly conductive as well as having a resistance to oxidation (column 1, lines 56-65) which in turn prevents an undesirable decrease in the electrical conductivity of the electrode. In view of Hahm, it would therefore be obvious to use iridium for the bottom electrode in the device of Hartner.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (571) 272-1920. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KVQ

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